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The
Futility of Technical Schools

In Connection with

Mechanics and Manufacturing or
Electrical and Civil Engineering

An Address to College Students

By

R. T. CRANE

Founder and President of Crane Co., Chicago

Additional copies of this pamphlet; also copies of the following pamphlets may be had on application to Crane Co., Chicago;

THE FUTILITY OF HIGHER SCHOOLING
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The Futility of Technical Schools

In Connection with

Mechanics and Manufacturing or Electrical and Civil Engineering

To the subject of higher schools, in all their departments, I have given much study for many years, and while I consider them all to be full of errors, deception and ignorance, the technical institutions are particularly misunderstood, and concerning them the people need to be enlightened.

This misconception of their value and importance is quite natural, as the whole subject is shrouded largely in mystery, since science is so largely connected with it, and concerning anything with which science is associated the masses have no correct opinion. They imagine that as science in the past has played an important part in the progress of civilization, this also must be the case today, which is not a fact.

WHAT IS SCIENCE?

At the outset let me state just what I mean by "science." The dictionary definition is very long, unsatisfactory, and, in my opinion, inconsistent with the general understanding of the word.

From my view-point "science" means the doing of things in a more or less highly intellectual way by taking advantage of natural laws and principles. Take, for example, the wheel in a wheelbarrow; the lever; the block and tackle; braces and truss-building and making of caissons, etc., etc. These are some of the things that I consider to be scientific, and I believe the general public will accept this definition.

Therefore, it will be seen that many scientific principles, while exceedingly numerous, are also exceedingly simple; in fact, most of them are so considered by a good mechanic. Notwithstanding this, however, the great mass of the unthinking public seem to be overwhelmed when anything is referred to as being scientific, and to think this means it is beyond their comprehension. Hence the great reverence they have for technical s and for men who specialize in scientific facts as they im such institutions are full of these mysterious matters.

WHY I AM HERE

For the past fifty-seven years I have been engaged active the manufacturing business, which has given me a vast amou experience with all classes of men, and ought to qualify m throw some light on this subject.

My purpose is to have a full and frank talk with you regar the value of technical schools in connection with mechanics manufacturing, electrical and civil engineering, and to assist in determining whether you are making a right start in life.

I am here in your interest solely, to try to do you some go and before I finish I believe you will agree that this is my obj

I may as well say at the outset that I consider the value technical schooling, especially in the lines just mentioned, i mensely over-estimated; hence my position is entirely differe from that taken by those who are accustomed to talk to yo Many of these people are mere theorists, so far as education questions are concerned, and have no knowledge whatever abo anything connected with the reasons for your being here.

There has been altogether too much talking to the galler instead of to you, and therefore you will find that what I hav to say is of an entirely different character. It is high time th real merits of this subject were presented to you, and I shal give you the facts, not my individual opinion.

IMPORTANCE OF STARTING OUT IN LIFE RIGHT

The question whether one is starting out in life right is decidedly the most important that ever arises with any person. I therefore urge you, before you go any further, to *stop, look and listen.* No boy or man in these days can afford to throw away eight of the most important years of his life in acquiring a schooling that will be of little or no use to him.

My experience convinces me that the boy who went into the factory or field to learn some business when you entered high school has a tremendous advantage over you, and that you never will be able to make up this loss of time and money.

Most people who have been successful owe their success largely to a right start. Of course they had natural ability to help them, but it may be said safely that if they had started differently they would not have succeeded so well.

On the other hand, if a great many who have failed had begun right, it would have been greatly to their advantage. This matter of a right beginning has not been given the consideration it deserves, but has been left largely to chance.

WHY YOU ARE HERE

You are starting out with the belief that a large amount of technical school training will be of use to you—in fact, that it is indispensable; hence you are here. But if I were to ask you for some sound or logical reason for being here, you would find it difficult, probably, to give any. It is my opinion that you are here for some of the following reasons:

First. Because of the popular feeling that these technical schools possess great merit, which feeling seems to be magnified by the growth of these institutions. Later you will see that this popularity exists simply among people who have little knowledge of the subject, and that these schools are promoted by educators because the great mass of the unthinking public has faith in them, thus affording these educators opportunity to humbug you and the public by multiplying them, all of which is a part of the whole higher educational scheme to fleece you and the public.

Secondly. Another way in which you are deceived is through the claims which the heads of these schools are making that a great many prominent employers favor their students and seek them for their business. Some of them go so far as to say that these employers are clamoring for you boys, and thus make it appear that your schooling is going to be of great value to you, which I shall show you is another fraud.

Thirdly: Another reason why some of you are here is because of the silly talk that is being indulged in by a few impractical men in business who are taking the ground that the technically school trained boys are superior to those who have had a practical training only, and that in their business they are giving preference to the former. I shall show you that these people are in a very small minority.

Fourthly. I think that the fascination which the word "engineer" possesses affects you, since it seems to be so much more dignified than "foundry man" or "plumber."

When we sum up the reasons for your being in a school of this kind we find that not one has a sound, substantial foundation, so that, as a matter of fact, you are here simply through the grossest deception. I challenge the heads of these institutions, or any business man who pretends to give preference to boys trained as you are being, to show any substantial results of such training.

MECHANICS AND MANUFACTURING

Let us first look into the question of the utility of technical schools in connection with general mechanics or manufacturing.

In considering such a question, theories, guesses, or the individual opinions of persons who have not given it any serious thought, or who are in the higher schooling business for money purposes, are of little or no value. What you want are facts or the preponderance of evidence from men of judgment who are in a position to have sound ideas on the subject, who have given it some thought, are free from prejudice and have no selfish interest in these schools.

Now, here are some of the facts:

FACTS

First: Comparing this country today with fifty years ago; it has gone to the greatest extreme in all kinds of technical schooling. In the United States today there are 129 technical institutions including universities that have a special department devoted to this branch of schooling, and the number of students taking this course of study is about 30,000, which in all probability means that about 10,000 boys are leaving these schools each year. From this we see that there would have to be an enormous demand in order to provide places for this large number of young men supposed to be trained for the higher and better positions.

Secondly. It is also a well known fact that this country was immensely successful before the technical schools were established.

Thirdly. Notwithstanding many educators are trying to make us believe that this country is going to destruction through dry rot and that the only means of saving it is through their schools, the fact is that no country on the face of the earth today is more prosperous or stands so high in everything in which technical schools are pretending to aid us as the United States.

Fourthly. All the heads of these technical schools, as well as all employers who claim to favor boys from such schools, admit that before such boys can be of any value in any line of business they must have a large amount of practical training.

Fifthly. Although tens of thousands of technically school trained men have been coming from these institutions, this class of men are doing little or nothing to contribute to the real prosperity of the country, and if you should go through our great industrial institutions you would find little trace of them in any important positions; probably not in one per cent.

IMPORTANCE OF EXPERIENCE

What a manufacturer wants is not a man of theory, but a man of brains who has had an immense amount of experience, who knows the state of the art thoroughly, and who understands all kinds of tools and what they are capable of doing. This is the only kind of a man that is of any account in a manufacturing business.

Hence we regard these schools as absolute failures, so far as being a help to general manufacturing and industrial business is concerned, and therefore it is not necessary to discuss this feature of technical school work.

However, as you cannot have too much light regarding it, I decided to go a little further to see what could be learned concerning the claim these schools are making that their students are in demand by large employers. In doing this, I selected the following technical schools (which are among the most noted institutions of this kind in the country and where results certainly could be shown if there were any) and requested them to send me the names and addresses of a few of the prominet employers that apply to them for their young men:

Armour Institute of Technology, Chicago, Ill.
Massachusetts Institute of Technology, Boston, Mass.
Stevens Institute of Technology, Hoboken, N. J.
Rensselaer Polytechnic Institute, Troy, N. Y.
Alabama Polytechnic Institute, Auburn, Ala.
Georgia School of Technology, Atlanta, Ga.
University of Illinois, Urbana, Ill.
University of Michigan, Ann Arbor, Mich.
University of Wisconsin, Madison, Wis.
Purdue University, Lafayette, Ind.
Princeton University, Princeton, N. J.
Harvard University, Cambridge, Mass.
Yale University, New Haven, Conn.

The following eight out of thirteen either refused to give the information asked for or dodged the question in various ways, although a second letter was sent them explaining just what was wanted and urging them to reply:

Alabama Polytechnic Institue.
Massachusetts Institute of Technology.
Stevens Institute of Technology.
University of Illinois.
Rensselaer Polytechnic Institute.
Purdue University.
Princeton University.
Georgia School of Technology.

Judging from the meagre showing made by the schools that did send in the names of employers seeking their young men, is it not fair to presume that the reason why these just mentioned did not do so was that they fail to receive such application? Certainly there could be no good ground for withholding this information if they had it to give; in fact, it would be greatly to the benefit not only of themselves, but of their students. The fact is, they simply have been humbugging you boys and the public on this question, and this is the way they try to get out of it.

The only schools that did supply the names of employers applying to them for their young men were:

Armour Institute of Technology.
University of Michigan.
University of Wisconsin.
Harvard University.
Yale University.

the total number of these names being eighty-eight.

THE VALUE OF THIS INFORMATION

Now the question is, of what value is this information From letters received in response to inquiry sent to a larg number of people on this list, I find that a great many of th young men whom the employers take from these schools g into electrical concerns, such as The General Electric Co., th Westinghouse Electric & Manufacturing Co., the Western Elec tric Co., the telephone companies, etc.

A large number are also taken by railroad companies.

The next demand of any considerable importance is fro people who make use of these young men in their chemic departments, etc.

Probably nine-tenths of all the technical school young men, to whom this investigation pertains, have gone into lines just mentioned. Most of the remaining one-tenth are employed in the drafting departments of concerns in other lines of business, and very few of them are found in manufacturing departments anywhere. So far as the General Electric Co. and the Westinghouse Electric Co. are concerned, they have not employed one of these young men as foreman or superintendent in their manufacturing departments.

Very few of what may be called prominent manufacturers, outside of those just referred to, are seeking young men from the technical schools; probably these do not amount to more than one per cent of the total number of large manufacturing establishments in this country. Take, for example, the iron and steel business. The United States Steel Corporation has, I understand, 260,000 employes, and other iron and steel companies employ fully as many more, but only one establishment in this line of business appears on the list that the colleges sent me of employers who seek their young men, and this one amounts to nothing. I merely mention this to give you an idea of how the very largest and most important business institutions in this country feel on this subject.

THE ELECTRICAL BUSINESS

So far as the electrical business is concerned, Mr. M. W. Alexander, of the General Electric Co., now admits that, after employing hundreds of these young men from the technical schools, this plan has proved a failure and he now has decided to adopt one radically different. He states also that other large companies have had a similar experience.

It will be seen, therefore, that so far as this demand is concerned it has existed under a mistaken theory. I shall treat this feature of the subject more fully later in my discussion.

RAILROADS

So far as the railroads are concerned, this matter was pretty thoroughly canvassed in my book, "The Utility of all kinds of Higher Schooling," wherein I gave the results of my investigation of the Pennsylvania Railroad. I discovered that although they were making great claims in regard to what they were doing in the way of employing technical school young men, as a matter of fact not more than five per cent of their strong men had received a technical school training.

Another notable fact is that the lists which the colleges sent me of employers seeking their young men contained ten railroads only. This probably does not represent more than ten per cent of the total number of large railroads in this country, so that if only five per cent of the important men in ten per cent of the railroads are technically school trained, it is evident that they are equivalent to not more than one-half of one per cent of the total number of important employes of all the railroads, which shows clearly that the demand from the railroads for you boys amounts to little or nothing.

To sum up the matter of the demand for boys trained in technical schools, you will see it has been nothing short of a gigantic fraud, and worthy of no consideration.

THE TWO WORST SINNERS

I cannot leave this feature of the subject without referring to the two worst sinners in this matter; namely, the University of Michigan at Ann Arbor, and the University of Illinois.

Although Michigan is, by all odds, the largest section of the country devoted to the manufacture of automobiles, and there are many large manufacturnig towns in the vicinity of Ann Arbor, the list furnished by that university does not contain the name of a single prominent concern, with the exception of the American Radiator Co., at Detroit, and this is an iron foundry.

As another example of the deception practised by this institution, I refer to an article published in the newspapers about three years ago, in which Prof. John R. Allen, head of the mechanical engineering department of this university, made the claim that among the great positions which were held by graduates of his department, nine out of eighty-five were presidents of manufacturing corporations.

Looking up these men, I find that three of them obtained their positions through family connections. Therefore, it cannot be claimed that higher schooling had anything to do with placing these persons in good situations. As for the others, it appears that, with few exceptions, after leaving college they knocked around in a great variety of work, one of them having been in fourteen different lines of business (from wholesale liquor to brokerage), and some of them finally became presidents of companies of their own, but that not one of these six companiees has any prominence whatever, so that this whole thing may be denounced as another higher schooling fraud written for the purpose of humbugging the public.

As to the University of Illinois, which has been making extravagant statements regarding the demand for its students, and claiming that employers are selecting these young men before they have finished their preparation, so anxious are they for their services, it refused to supply the name of one of these employers, giving as an excuse that it felt it would not be wise to send out the names of these business firms without their consent. I leave it to the public to judge as to the real cause of their refusal.

SMALL PAY

If these technical schools were turning out young men who possessed real merit, and who, after their eight years of schooling, can be hired for twenty cents an hour, as I shall show the General Electric Co., and pretty much all other employers, have been doing, they certainly would be in demand and every important business establishment in this country would seek them. This would be parallel to the case of an article of merchandise that is being offered at one-half its cost, which certainly would not have to go begging for customers. This fact in itself proves conclusively that the technically school trained young men have little merit, for otherwise they would be in demand at better pay.

GROSS INCONSISTENCY

The business men who pretend to favor technical school boys certainly are grossly inconsistent in this matter, for while they claim that these young men possess great merit, and are exceedingly valuable to them in their business, they give them during the first year, as they admit when questioned, about two dollars a day only.

This clearly shows either that these people have been untruthful in what they have had to say regarding the value of these young men, or else that they have been grossly and shamefully under-paying them. Such compensation certainly is very small pay for a person who has any ability, and it offers little encouragement to a boy to devote eight years after leaving the grammar school, to the acquisition of what is called higher schooling.

ELECTRICAL ENGINEERING

Having now finished my talk, so far as it relates to technical schools and mechanics or manufacturing, I will take up the question of the utility of these schools in connection with the electrical line of work, which, if anywhere, would seem to be a feature of schooling wherein these technical institutions would be much more likely to produce good results.

On this subject I am fortunate in obtaining a copy of a paper by Mr. W. M. Alexander, of the General Electric Co., in which he discusses the question of the utility of technically school trained boys in their business, and he admits, as I have previously stated, that after having employed hundreds of these boys, he finds that his method of handling them heretofore has proved a failure and he has now concluded to try a radically different one.

Mr. Alexander now sees all sorts of short-comings in the technical school boys, stating that they have a speaking acquaintance only with machines and materials, that they have no ideas as to values, etc. He also volunteers the information that other large employers who have tried the college boys in their business have had a similar experience. No doubt he has reference to the Westinghouse and Western Electric companies, as both are very large concerns and are in much the same line of business as the General Electric Co.

These three companies have been taking a very large proportion of the boys from the technical schools who secure positions upon leaving these institutions, and in view of the facts disclosed by Mr. Alexander, you can see what a frightful blunder has been made. This gentleman has a great deal to say on this whole subject, and as his paper is very interesting, I reprint at the close of this pamphlet that portion of it which relates to this particular question.

Since the utter folly of trying to make electrical engineers in this way has been shown by the testimony of one who has been an earnest advocate of the technically school trained electrical engineer, and who, after a long and extensive experience with the boys of the technical schools, has became convinced that they are utterly lacking in merit, it is unnecessary to continue the argument further.

ABSURDITY OF GENERAL ELECTRIC CO.'S PLAN

I feel, however, that it may be profitable to you to show the down-right absurdity of the plan which the General Electric Co. have been following. They take these boys from the technical schools and give them two years in the testing department, starting them for the first six months at 20 cents an hour, and giving them toward the end 27½ cents an hour. The boys are then taken to the engineering department, where they start in at about the same pay they have been getting in the testing department, and spend two years there. This brings the boys up to about twenty-seven years of age, and they will be very lucky if, on leaving, they can go out and secure a job at $3.00 a day.

And there are excellent reasons why no one is willing to pay such a young man any more. He is still very far from being an electrical engineer, for he is not a machinist (which is an important feature of an electrical engineer's training); he has had no experience in erecting or operating; he knows nothing about costs (which knowledge is necessary to enable him to make estimates), in fact, he knows nothing about the many subjects in which experience is necessary in order to make him what might be called an electrical engineer. No wonder Mr. Alexander says such persons are failures. The pay they receive proves that.

CRUEL DECEPTION

These boys have been deceived cruelly, not only by the college, which has pretended to make electrical engineers out of them, but upon leaving college and going with the General Electric Co. they have been treated still more cruelly as this company has, by inference, given them to understand that it will be honest with them and really make electrical engineers out of them, whereas, after spending four years here, as I have already shown, they receive only low mechanics' wages. To call this a miserable, scandalous fraud and outrage on the boys is putting it very, very mild; and this is what comes from a lot of cranks who pretend to make electrical engineers.

A WORSE CASE

As evidence of the small value that the manufacturers in Germany place upon the schooling in electrical lines that is furnished in the technical schools, I understand that, instead of paying the boys from such schools anything for their services, they require these boys to pay them for the privilege of working in their factories.

COMMON SENSE METHOD OF MAKING ELECTRICAL ENGINEERS

The common sense way to make electrical engineers is as follows:

Select, with the greatest care, boys about 16 or 17 years of age for machine shop apprentices. Watch over them carefully. in the first instance to see that they are what the employers are seeking as material for good machinists. If the foremen who keep close eye on the boys discover that some of them have unusual ability, let such be put in the line of direct training for electrical engineering. Such boys, after having two years of training in the machine shop (say one year at bench work and a year at tool work), shifting around considerably, would get the knowledge of that part of the work which is required to make of them good electrical engineers. Then let them spend six months in the testing department, six months drafting, a year in the erecting department and a year in the operating department.

While working in this way they are surrounded constantly by an electrical atmosphere and will absorb, through observation and association, nine-tenths of all the knowledge they will need to have regarding electricity, and all this will have a splendid influence over them. The grandeur of the work is particularly inspiring, and the absorbing of all this information takes none of their time, as it is done unconscously.

During this period the boys could attend night school as much as is necessary and be furnished books on the science of different lines of electrical apparatus, books containing only such things as the best practical men know to be essential. If necessary, lectures could be given advantageously by the company's own engineers who know decidedly better what these boys require than any school teacher could possibly know.

This would make five years in all, and then you would have a young man who, at 21 or 22 years of age, would be a fairly good electrical engineer. Such a man is likely to make his mark and certaily should be of considerable value to any one requiring his services. Besides this, he would have been earning his living all this time.

Before leaving this feature of the subject, let me call your attention to the fact that none of the greatest elecrical engineers this country has had ever saw the inside of a technical school where electricty was taught. I shall not undertake to name all of these men, but among the list will be found Edison, Sprague, Brush, Rice, Westinghouse, Thomson and Hueston.

This being the fact, is it not perfectly clear that the very best kind of electrical engineers can be produced by following the plan just outlined? In other words, this is the distinction between theory and common sense, or between higher schooling and higher education.

CIVIL ENGINEERING

Lastly, we come to the real purpose for which technical schools were established; namely, the making of civil engineers.

The founding of these schools was conceived on a good, common sense basis, the idea being, I imagine, that here was the storehouse for specimens, such as drawings, specifications, etc., showing all of the fundamental and unusual scientific engineering knowledge. Now, if this idea had been carried out, and such knowledge had been thoroughly classified and systematically taught to such students only as really needed it, these schools would have done some good work and rendered substantial benefit to the public .

But, after all, these schools have a limited field only, even in this line of work, because at least ninety per cent of all civil engineering work is of a simple nature. It is like an open book and almost all the principles and sciences involved in it are thoroughly understood by a large proportion of those who are connected in a mechanical way with the construction of such work. This information has been handed down the line from generation to generation.

But if an engineer, after having acquired all the knowledge of this work that he has had an opportunity to learn in a practical way, feels that there are some other features of civil engineering, concerning which he desires to have further information, it is time enough then for him to go to a technical school for, say, six months for the purpose of getting exactly what he wants in this respect.

HIGH CLASS ENGINEERING

Now we find that the work of a very important character that has been performed in the civil engineering line, which probably amounts to not over ten per cent, has been about equally divided between the technically school trained engineer and the engineer who has received a practical training only, and it is safe to say that the work of the latter will average fully as well as that of the former. Hence there is doubt about the utility of the technical schools even for making the very best civil engineers.

I might go still further and speak of the great civil engineers that we had before the technical schools came into existence, but shall not do so as there is no occassion for lengthening my address for this purpose.

PREJUDICE SHOWN BY THE IGNORANT PUBLIC

Notwithstanding the foregoing facts, however, we still find that there is a demand for the technically school trained civil engineer. But I maintain that this is due entirely to the feeling which ignorant employers of such men have that the technically school trained engineer, especially if his schooling was obtained in some institution in Germany, is superior to the engineer whose engineering knowledge has been acquired in a practical way. This is the reason preference is given to this class of civil engineers.

The ignorant public seems to be unable to comprehend that almost everything in the civil engineering line can be learned outside a technical school and while a man is working at this business, and such people are deceiving themselves most grossly by giving preference to the technically school trained engineers. They fail to realize that the technical schools know nothing beyond what the practical man has taught them.

Now, boys, whether you can get along better in life, and be more successful by yielding to this prejudice, then you could by simply going out into the field and learning your engineering in a thorough and practical manner, and then, as I have previously suggested, spending, say, six months in one of these schools for the purpose of getting a complete history of all that has been done in the particular line of engineering in which you are interested, is for you to determine.

COMMENCING AT THE RIGHT END

Finally, as I have stated in the early part of this talk, teachers and employers in all lines admit that if a man is going to be an engineer after leaving the technical school he must do a large amount of practical work before he can be of any value in any line. The main difference between their position and mine is that I favor doing the practical work first, for the very important reason that nine-tenths of the theory can be acquired while learning the practical; hence saving a large amount of schooling and expense.

Now, the amount of practical experience which I have referred to several times and which every one agrees the college man must have before he can be of any value, has, in my judgment, been greatly underestimated. I maintain that a very large amount of experience is necessary to make him of real value. For example, how much experience must an engineer from one of these schools have in order to judge whether a railroad should be run at one grade or another? Or as to which is the best side of a river to run the road where a large amount of grading and rock cutting is to be done? Or what the policy should be of building a tunnel, or of making a cut, or of going around a point of land?

I maintain that no person, in a case of this kind, can be of any real worth unless he has had sufficient experience to make him a successful railroad contractor, and whenever a railroad company is needing the services of a strictly first-class engineer, it better select a successful railroad contractor.

What applies to railroad engineering, applies equally well to any and all kinds of engineering. Practical experience, not theoretical schooling, is the key to success.

You need not expect, therefore, that you are going to be called upon to construct tunnels through the Alps, or under the Thames, or to build Eddystone lighthouses, or bridges like the Eads Bridge at St. Louis, or the one across the Thames, or dry-docks where quicksand prevails, etc. You will discover on leaving school that such work is for you a long way off.

As a matter of fact, you boys may as well understand that not one of you in a thousand, even under the most favorable circumstances, will make a first-class engineer. To be a first-class engineer a man must have decided natural tendencies in this direction, be a born engineer, and he is the only one who ought to go into the higher engineering science.

You will be greatly shocked, upon leaving the school, to find very few employers will take you, and that those who do give you very small pay; also that instead of starting out ıe top, as your teachers have largely given you to understand can do, it will be necessary for you to start away down at s wages. You will be a class of bitterly disappointed young when you begin to face this fact.

COLLEGE AUTHORITIES SHARP-PRACTICE MEN

\s you grow older you will discover that there are many kinds harp-practice men, each of whom has his own way of bleed- and defrauding the people in order to make his money, is, to steal your money. The man who picks your pocket, man who robs you, the burglar who enters your house, or trusts that are mulcting you on every side are all decidedly ous, but they are insignificant thieves compared with the who induces you to spend your money and eight or ten he best years of your life in acquiring something that will f little or no value to you. You can overcome, perhaps, the of the money which these things have robbed you of, but cannot afford to be robbed of the years which should be loyed in laying the foundation of your future career by :h you can support yourself and family.

IN CONCLUSION

ritiсisms upon my method of dealing with this subject have ı made, and there comes to me a recent instance of a young of fine character and excellent home training, who, in an uarded moment, while in the employment of the post office ırtment in Chicago, took one dollar from a letter, and was to the penitentiary for one year.

f it was justice to punish this young man by committing him ıe penitentiary for his act, what should be done to the people are using every possible effort to induce boys to spend eight ıe best unfolding years of their lives in securing a training :h will be of no practical value to them in later years?

Therefore, I have no apology to offer for what any one may the harshness of my views.

EXTRACT FROM MR. ALEXANDER'S PAPER

(Referred to on page 12)

\s a member of the supervisory committee, I have had an sual opportunity to study at close range several hundred of graduates of technical schools, and to follow their early careers as junior engineers in various positions with the company. Although the present system of engineering training possesses many points of merit and has turned out engineers of high rank, nevertheless I have become convinced that this combination of four years of mental activity in college with two subsequent years of practical shop work in the student course, calling for physical exercise to a large extent, is not the most effective method of training designing, commercial and construction engineers.

It fails to give that insight into the practical side of electrical engineering and into the proper relation of the economic forces of an industrial organization that is more and more demanded of those who wish to take positions in the industrial field. Moreover, the atmosphere of college is charged with little of the seriousness of business. The corelation of theory and practice is not sufficiently close to facilitate the proper appreciation of the sciences in their concrete application. While shop practice courses at college endeavor to approximate the desired condition, it must be admitted that they can give at best only a feint idea of the real industrial situation.

The truth of this statement will be readily admitted by those who have employed many college graduates in engineering positions and have followed rather closely their early careers as engineers.

The college has initiated the young man only in a very general way into the practical processes, and has given them but a speaking acquaintance with machines and materials; of course, hardly more can be expected of the colleges in view of their limited equipment and the brief time available for this purpose. Moreover, consideration of the elements of time and money in carrying out practical work is entirely neglected at college, although the proper appreciation of economic values is the important factor that makes for success in industrial life.

Only extended experience in practical work in which time and money play leading parts can instill a proper conception of these values. It is natural, therefore, that colleges leave to subsequent practical life the young men's development along these lines. Similarly, no amount of the study of political economy at college alone can give the student a true perspective of the relations of employer to employe and of the new economic and sociological phases that prove more and more perplexing in our complicated industrial system; a thorough knowledge and appreciation of these forces, however, are today considered essential for those who are called to positions of responsibility in the executive and administrative departments of industrial life.

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